

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
8 April 2004 (08.04.2004)

PCT

(10) International Publication Number  
WO 2004/030198 A3

(51) International Patent Classification<sup>7</sup>: H02N 15/00

(21) International Application Number:  
PCT/CA2003/001501

(22) International Filing Date:  
29 September 2003 (29.09.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/413,881 27 September 2002 (27.09.2002) US

(71) Applicant (for all designated States except US): THE  
UNIVERSITY OF BRITISH COLUMBIA [CA/CA];  
Industry Liaison Office, 103 - 6190 Agronomy Road,  
Vancouver, British Columbia V6T 1Z3 (CA).

(72) Inventors; and

(75) Inventors/Applicants (for US only): DAVIS, Harold  
[CA/CA]; 4065 West 13th Avenue, Vancouver, British Co-  
lumbia V6R 2T3 (CA). WHITEHEAD, Lorne [CA/CA];  
3015 West 12 th Avenue, Vancouver, British Columbia  
V6K 2R4 (CA).

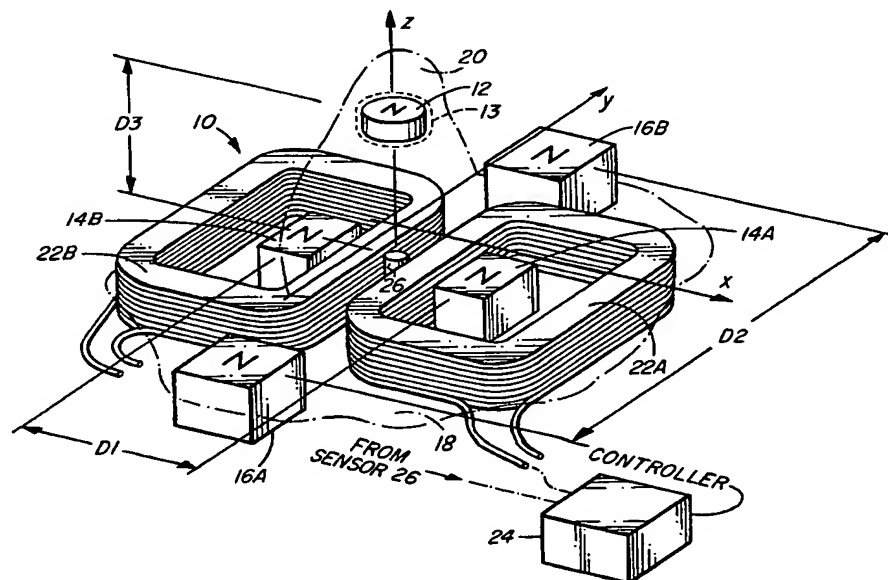
(74) Agents: MANNING, Gavin, N. et al.; Oyen Wiggs Green  
& Mutala, 480 - The Station, 601 West Cordova Street,  
Vancouver, British Columbia V6B 1G1 (CA).

(81) Designated States (*national*): AE, AG, AL, AM, AT (util-  
ity model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA,  
CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (util-  
ity model), DE, DK (utility model), DK, DM, DZ, EC, EE  
(utility model), EE, EG, ES, FI (utility model), FI, GB, GD,  
GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,  
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN,  
MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU,  
SC, SD, SE, SG, SK (utility model), SK, SL, SY, TJ, TM,  
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,  
ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,  
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: MAGNETIC LEVITATION APPARATUS



(57) Abstract: A magnetic levitation apparatus supports a magnetic element in a magnetic field. A control system controls a variable magnetic field to maintain the magnetic element at an equilibrium location relative to an unstable axis. In some embodiments the variable magnetic field has a gradient in the direction of the unstable axis but no field component. In some embodiments the magnetic field is provided by an array of four discrete magnets. In some embodiments additional magnets provide increased field intensity at the equilibrium location this increases stability of the levitated magnetic element against overturning. Light and electrical power may be supplied to the levitating magnetic element.